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REVIEWS OF RECENT LITERATURE.

GENERAL BIOLOGY.

Rôle of Vexillary Organs. — To determine whether certain showy, so-called "vexillary" organs, external to the flower, have any part in attracting insects is the purpose of a series of careful observations by the veteran student M. Félix Plateau.¹ Two species are studied under prearranged conditions. One of them is *Salvia horminum*, whose strict stems are crowned with showy reddish or violaceous bracts, occupying the upper fourth of its height, with the small and inconspicuous flowers arranged in verticils, with green bracts lower on the stem. The question was: Would these showy tops, often mistaken by men for flowers, deceive the insects?

The insect visitors were mainly (more than 90 per cent) Hymenoptera, with a few Lepidoptera and Diptera. The bees, to which fertilization is mainly due, behaved as if the showy tops did not exist, passing directly to the flowers, and very rarely seeming to notice the "vexillary" parts. They behaved with the showy plants precisely as they did with other plants from which the showy tops had been removed, and just as they do with the wild germander (*Teucrium*), which has green tops.

The number and nature of the errors committed by insect visitors are tabulated in detail. These are mainly short haltings before the bracts without settling on them, and occur oftenest during passage from stem to stem and not on first approach. Including such slight mistakes, the Hymenoptera averaged but one error to fifty-five flowers visited; the Lepidoptera, one error to seven flowers visited. In case of the Lepidoptera (and Diptera also) the errors are oftener real errors, reaching even attempts at extracting nectar from the buds of showy bracts. These results add cumulative testimony to the acuter perceptions of the Hymenoptera.

Hydrangea opuloides was also studied; both the wild form, with a few showy, sterile, peripheral flowers to each of its cymes, and the

¹ Plateau, Félix. Nouvelles Recherches sur les Rapports entre les Insectes et les Fleurs; Étude sur le Rôle de Quelques Organes Dits Vexillaires, *Mém. Soc. Zool. de France*. Année 1898, pp. 339-375; 3 figs.

cultivated form (Japan rose), with flowers all sterile and showy. On the former the insect visitors were not numerous, and were limited to pollen-eating Diptera and Hymenoptera. These alight from the first upon the fertile flowers, passing directly over the sterile ones, making few even slight errors (Hymenoptera, one to seventy-seven visits; Diptera, one to eighteen visits), making still fewer obviously complete mistakes. In the cultivated form the flowers are neglected altogether, or, retaining somewhere occasional anthers, attract a few *Syrphus* flies directly to these.

Having shown that the "vexillary" peripheral flowers are almost entirely disregarded by insects near at hand, M. Plateau proceeds to show that they do not exercise any special attraction at a distance, citing two facts in evidence: (1) that the peripheral flowers open several days before the fertile, and remain fresh for several days after the fertile have faded; and (2) that the very showy cultivated flowers, lacking pollen and perfume, attract no insects. He shows also that insects do not learn by individual experimentation the nature of the two sorts of flowers. Then he objects to the idea of their possessing hereditary instinctive knowledge on the very insufficient ground of analogy with birds which have to learn to recognize inedible larvæ by individual experience.

The search for a basis in observable facts for the theories of coloration long current is certainly most desirable; and while every one will acknowledge the value of the facts discovered, one may still think that they do not fully justify the general conclusion, that these so-called "vexillary" organs have no right to be so considered. For if one fully agree with M. Plateau, that the fertilization of the flowers in question "would not suffer from the absence of these parts" at the present time, still the old theory would serve to explain their origin in the past; and the fact that mistakes are still made is not to be disregarded.

The old explanation of the coloration of bracts, etc., has been so satisfactory and so applicable to many facts of different kinds, that in absence of any substitute one may feel reluctant to abandon it, especially while our knowledge of the nature of the apperceptions of insects is so meager that we may hardly judge by what means they discover the flowers. That insects should make mistakes is no part of the theory; it does not assume that the external showy parts should delay visitors or divert them from their proper course to the pollen or the nectar.

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